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Mr Paul Freeman
Team Leader - Resource Assessments
Department of Planning, Industry and Environment
GPO Box 39
Sydney NSW 2001

Dear Sir,

Russell Vale Colliery
Underground Expansion Project

We refer to the Independent Expert Scientific Committee (**ISEC**) advice dated 19 November 2019 in relation to the Wollongong Coal Limited (**WCL**) Russell Vale Underground Expansion Project (**UEP**).

The ISEC advice states the following:

> *The proponent states that there is a "negligible risk" of pillar failure (Umwelt, 2019, p. 9), but they have not quantitatively assessed the residual risks. If the likelihood of pillar failure is "extremely rare" (less than 0.01% per year; Australia Institute for Disaster Resilience, 2015) and does not result in the catastrophic loss of a single swamp, then the IESC would not regard this proposal as being of material concern. However, if multiple assets are threatened or the likelihood increases, then the risks are of greater material concern.*

The ISEC advice further states the following:

> *Accordingly, for the purposes of this advice, the IESC have considered two scenarios:*
>
> > *1. a "negligible risk" scenario (as assumed in the Revised Preferred Project Report (RPPR)) in which it is expected that the likelihood of pillar failure is less than 0.01% per year; and,*
> > *2. a "worse case" scenario in which the likelihood of pillar failure is materially greater than 0.01% per year.*
>
> *The decision as to which scenario is appropriate depends on the outcomes of the quantitative risk assessment, noted above, which is recommended to be undertaken and provided by the proponent. The responses below address both scenarios.*

WCL provided an initial response within a letter dated 14 January 2020 that included a quantitative assessment of the risks of pillar failure, prepared by SCT Operations Pty Ltd (**SCT**).

The SCT report concluded with the following statement:

> *Our assessment indicates that the risk of "Catastrophic loss of a single swamp" due to subsidence impacts associated with proposed mining in the Wongawilli Seam is "very rare" or less than 1 in 10,000 years. The potential for further impact to water resources, including stored water, surface water and groundwater, from proposed first workings in the Wongawilli Seam is assessed as negligible.*

The "*very rare*" description, using the references provided by the ISEC, equates to an annual exceedance probability of 0.01%.

WCL assert that the ISEC questions posed under the "*Worst Case*" scenario are not of material concern and therefore will not be considered further. This is supported by the SCT quantitative assessment of the risks.

On this basis, WCL provides this submission to address the other matters raised within the ISEC advice under the "*Negligible Risk*" scenario.

Water Losses

Question 1: The RPPR provides predictions of cumulative water losses from current and proposed mining at Russell Vale. Does the IESC consider that the decision makers can have confidence in these predictions, particularly given the:

a) multi-seam mining environment; and
b) presence of the Corrimal Fault and Dyke 8 in the mine area?

1. The IESC considers that confidence in the predictions of cumulative water losses from proposed mining could be increased to better understand potential impacts. This should include an analysis of the uncertainty of the current model simulations for both groundwater and water balance models.

An uncertainty analysis of the Geoterra/GES groundwater model has been undertaken by HydroAlgorithmics Pty Ltd (HydroAlgorithmics) and subjected to independent peer review by Dr Frans Kalf of Kalf and Associates Pty Ltd.

The Uncertainty Analysis and Peer Review are included within an Appendix of the revised Geoterra/GES Groundwater Report, provided within Response to Submissions – Part B (RTS Part B).

The HydroAlgorithmics uncertainty analysis addresses parameter uncertainty by stochastic modelling using the Monte Carlo method, which generated numerous alternative parameterisations of the deterministic flow model (realisations), execution of the model independently for each, and then aggregating the results for statistical analysis. Uncertainty was assessed on hydraulic conductivity, recharge, evapotranspiration, specific storage and specific yield properties throughout the model.

Statistics on key predictive outputs were computed from the results of the 141 accepted model runs and percentile results were calculated from the Monte Carlo outputs strictly on a conservative "round to higher value" basis, and represented as "probabilities of exceedance" in five categories. Drawdown, additional mine inflow and streamflow impact results were all computed on the

difference between the impacted and baseline scenarios. All flow results presented are the maximum flow over time.

2. The proponent should clearly identify and distinguish the individual contributions from the project to cumulative losses. Differentiation of the sources of cumulative losses are needed to understand the potential impacts from the proposed project and to confirm the proponent's assertions of negligible impacts to water resources.

The revised Geoterra/GES Groundwater Report, provided within RTS Part B (Chapter 10) provides information of the individual contributions from the project to cumulative losses.

No upland swamps are present downstream of the WCL Russell Vale mining lease area and no other adjoining mining operations provide a cumulative impact on upland swamps.

Groundwater modelling indicates that the influence of the proposed first workings can be broken down into the depressurisation of two separate regimes:

- Within the Wongawilli Seam; and
- Overburden above the Wongawilli Seam.

The Wongawilli Seam and overburden immediately overhead would be depressurised to atmospheric pressure in the immediate footprint of the workings, however, there would be minimal transgression of depressurisation above the Bulli Seam at the end of the mining period.

The overlying Balgownie and Bulli seams have previously been mined and therefore significant depressurisation has occurred historically. The shallower surficial strata groundwater levels/pressures will be unaffected by the proposed first workings.

3. As the Corrimal Fault and Dyke D8 are stated to be dry (Umwelt 2019, p. 70), they are unlikely to have an effect on the cumulative water losses. The IESC is confident that these two geological features are unlikely to contribute to increased cumulative water losses.

Noted.

Upland Swamps

Question 2: Have the impacts of the Revised Project on upland Swamps been adequately described and assessed?

6. The likely additional impacts of the revised project on upland swamps have been adequately described and appropriately assessed as negligible under this scenario.

Noted.

Additional Information

Question 3: Are there any significant impacts or risks to water resources that have not been adequately identified and / or assessed, particularly in regard to Sydney's drinking water supply?

9. The proponent has not adequately assessed the potential long-term influence of the adits on water resources. The adits may impact groundwater levels and flow paths, and discharge from the adits could impact surface water quality. The potential influence of the adits should be investigated further, including through an uncertainty analysis using the groundwater model.

The revised Geoterra/GES Groundwater Report, provided within RTS Part B outlines at Section 9.80 that the groundwater inflow rate gradually increases during extraction of the proposed first workings as they are dewatered. After the proposed first working mining activities are completed, the pumps are turned off and the mine gradually fills up and re-pressurises the overburden.

The groundwater model simulated recovery at the location of the mine entry adit for the Wongawilli Seam that daylights in the Illawarra Escarpment, which is located at the existing mine portal entry. Groundwater levels in the Wongawilli Seam recover to above the LW4, 5 and 6 and the proposed first workings pre-mining levels and reach the 117.5m AHD elevation of the escarpment adit at around 2057. The modelled discharge rate out of the adit, with the outflow gradually increasing to a maximum of approximately 0.3ML/day as the mine and overburden re-saturates relatively quickly to adit level then stays there as it keeps draining out of the adit.

The matter of long term water flow from mine adits as goaf re-pressurises was considered within the *Independent Expert Panel for Mining in the Catchment* report dated 14 October 2019, with the Executive Summary stating the following:

> *Where mine entrances (or other natural or mining-induced flow conduits) emerge outside the Special Areas at an elevation below the groundwater table and cannot be effectively and safely sealed, a perpetual water loss is likely. Potentially, water flowing from these conduits will require treatment in perpetuity before discharge to waterways or being put to beneficial use.*
>
> *Options identified for offsetting water loss from the Special Areas include:*
>
> - *treating the water pumped from the mine to a standard that enables it to supplement water that would otherwise be drawn from the Greater Sydney Water Catchment.*
>
> *Provided that future mining at Metropolitan Mine continues to satisfy the performance measures and that when the mine is eventually sealed, water cannot escape from the mine entries or along geological discontinuities, the take of water from the catchment is currently of no immediate or long term concern.*

WCL is currently exploring a range of beneficial reuse options, ranging from potable, recreational and industrial reuse, for groundwater stored within underground working with Sydney Water and other parties. The feasibility of these options will be subject of specific project review and analysis.

The long term influence of the adits on water resources can be undertaken within the post-approval Groundwater Management Plan, with decisions provided on the preferred long term management strategy adopted, including uncertainty analysis on the potential influence of the any adit outflows.

10. The estimate of catchment runoff undertaken for the water balance modelling is only 0.2% of mean annual rainfall and appears unreasonably low (this may be because the Farm Dams calculator used in the analysis provides estimates of "permitted harvestable runoff" not mean annual runoff). Further clarification is required regarding the assumptions relating to the water balance estimates as these have

implications for dilution requirements, catchment yields in Bellambi Gully Creek and the sizing of water management infrastructure.

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Surface Water Management Plan, including an updated site water balance prepared in accordance with the Water Accounting Framework (**WAF**) and subject to annual review.

11. If it is assumed that pillar destabilisation does not occur, then the flood risks are negligible.

Noted.

Monitoring

Question 4: Are there any additional mitigation, monitoring or management measures that should be considered by decision makers to address residual impact of the project on water resources in conditions of consent?

14. The IESC strongly recommends that the pillar design is independently peer-reviewed by experts who are suitably qualified in multi-seam geomechanics stability, to ensure that it meets current leading practice in mine design, and that all implications for water resources are adequately considered. The review should be based on the most comprehensive local and international databases of pillar failure available at the time of the review.

The pillar design has been independently peer reviewed by B K Hebblewhite Consulting within a report dated 12 October 2019, which is contained with the Response to Submissions – Part A (**RTS – Part A**) report.

15. Further monitoring is essential for the proponent to demonstrate that the effects of the proposed project are negligible as stated in the RPPR.

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Subsidence Monitoring Plan.

16. The IESC suggests the following subsidence monitoring.

> *a. A plan should be developed for each section of bord-and-pillar extraction, especially sections located east of Mount Ousley Road. Each extraction plan should review all subsidence monitoring data from previous sections to confirm that no ground movements have occurred from the project before the next section is commenced. The review should also assess pillar stability nearby, including in overlying historic workings.*

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Subsidence Monitoring Plan.

b. To achieve the above, the proponent should consider using various recently developed subsidence monitoring measures (e.g. InSAR (Interferometric Synthetic Aperture Radar) or LIDAR (Light Detection and Ranging)) in addition to conventional subsidence monitoring lines. InSAR and LIDAR give greater spatial coverage and should identify localised areas of subsidence above destabilised pillars that are not on a conventional monitoring line.

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Subsidence Monitoring Plan.

17. Groundwater and surface water monitoring should focus on multi-seam extraction areas and include the following.

a. To identify potential changes in connectivity between aquifers and/or surface waters, the pumping rates of mine inflows should be regularly measured and compared to predicted inflow rates.

Noted.
This recommendation of the ISEC can be incorporated as a requirement of the post-approval Groundwater Management Plan.

b. The current spatial- and depth-distribution of bores is insufficient. Additional groundwater monitoring bores (including vibrating wire piezometers) should be installed to monitor the propagation of drawdown and to validate groundwater model predictions. These additional bores (including multi-level nested piezometers near swamps) should include targeting areas coincident with surface-water features and swamps. Additional bores are also required in strata below the Scarborough Sandstone, including the coal measures. Testing of hydraulic properties (e.g. hydraulic conductivity and specific storage) should be undertaken at any newly installed bore.

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Groundwater Management Plan.

c. The proponent acknowledges that there is potential for pillar instability in marginally stable areas to result in additional subsidence of 1 to 2 m (Umwelt 2019, Appendix 1, p. 27). Additional comprehensive groundwater investigations focused on these areas, using multi-level piezometers and other suitable techniques, are required to understand potential risks and impacts

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Groundwater Management Plan.

d. The proponent should develop a program for regular review of groundwater and surface water monitoring data which includes updating of relevant models.

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Groundwater Management Plan and Surface Water Management Plan.

> *e. Monitoring of water level and water quality of both surface water and groundwater is required to establish a baseline and to track changes over time including post-mining.*

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Groundwater Management Plan and Surface Water Management Plan.

18. The following monitoring measures are suggested to assess whether any impacts to swamps have occurred or are possible due to the project.

> *a. Nested monitoring bores and environmental water tracers should be used to identify whether a hydraulic connection exists between the perched aquifers upon which the swamps rely and the Upper Hawkesbury Sandstone aquifers (as suggested in Umwelt 2019, Appendix 2, pp. 115-116).*

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Groundwater Management Plan.

> *b. Updated surveys of current biodiversity, species distribution and swamp condition are essential due to observed spatial variability and the presence of at least three threatened species (Prickly Bush-pea – Pultenaea aristata; Giant Burrowing Frog - Heleioporus australiacus; Giant Dragonfly – Petalura gigantea) (Umwelt 2019, pp. 87-88). Individual swamps are likely to differ from each other in biodiversity and ecological condition so it is important that each swamp is surveyed separately and that seasonal variation in community composition is recorded to measure natural variation within and among swamps. The IESC recommends swamp-specific ecological monitoring should continue during the life of the mine and for a suitable period afterwards until the risk of any further ground movements can be demonstrated to be negligible.*

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Biodiversity Management Plan.

> *c. Swamp-specific water balances should be calculated based on monitoring data, including for reference swamps. These are needed to differentiate changes caused by mining from those associated with natural and climatic variability and will be required to demonstrate negligible impact from the project.*

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Surface Water Management Plan.

19. Further consideration should be given to potential downstream impacts in the Bellambi Gully Creek, especially if there is the potential to affect important estuarine processes. This potential remains unclear as the proponent has not included the downstream Bellambi Gully Creek area in the biodiversity assessment provided in the RPPR.

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Surface Water Management Plan and Biodiversity Management Plan.

20. Currently, the EPL 12040 (NSW EPA 2019) specifies discharge limits for pH, electrical conductivity (EC), total suspended solids (TSS) and turbidity in Bellambi Gully Creek. The proponent should undertake the following to address potential risks associated with discharge of treated water into Bellambi Gully Creek:

> *a. monitoring of analytes in addition to pH, EC, TSS and turbidity, such as a broad suite of metals and other contaminants and compare these results with the ANZG Guidelines (2018) for 95% species protection for aquatic ecosystems;*

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Surface Water Management Plan.

> *b. collating data on the total flow volumes and frequencies of high, median and low flows. Changes to the flow regimes may have direct effects on native biota (e.g. potential breeding and nursery habitats of native fish) and the water quality of the receiving environments; and,*

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Surface Water Management Plan.

> *c. development of site-specific in-stream water quality objectives for physico-chemical parameters which have considered the ANZG Guidelines (2018) for aquatic ecosystem protection as detailed in Huynh and Hobbs (2019).*

Noted.

The merits of this recommendation of the ISEC can discussed and agreed with the EPA. If the EPA decide that site specific in-stream water quality objectives are required to be developed a Pollution Reduction Program (PRP) can be developed. The Russell Vale Environmental Protection Licence 12040 (EPL12040) can be varied by the EPA to include such a PRP with agreed objectives and delivery timeframes.

21. A quantitative site-specific water balance is needed for Bellambi Gully Creek that accounts for the various sources of uncertainty (e.g. using the Water Accounting Framework for the Australian Minerals Industry, Minerals Council of Australia 2014) and includes:

a. the total water supply and demand under a range of rainfall, climatic and water demand scenarios to support the uncertainty analysis;

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Surface Water Management Plan, including a site water balance.

b. the required water infrastructure, including infrastructure capacity and transfers;

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Surface Water Management Plan, including a site water balance.

c. the volumes of water requiring discharge under a range of rainfall scenarios; and,

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Surface Water Management Plan, including a site water balance.

d. the potential water quality impacts caused by one or more of the above water management actions.

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Surface Water Management Plan, including a site water balance.

22. The IESC suggests that the proponent prepare an updated Rehabilitation Management Plan that considers:

a. the geochemistry of any rejects which may be deposited within mine workings and the potential for interactions with groundwater;

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Rehabilitation Management Plan.

b. the potential long-term impacts of adit outflows by providing further information on expected changes in outflow quantity and quality, including if this groundwater may interact with rejects deposited within the mine workings. This is needed to guide treatment options; and,

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Rehabilitation Management Plan and Groundwater Management Plan.

> *c. the potential legacy impacts and costs of long-term (greater than ten years) monitoring and sampling of swamps and surface water.*

Noted.

This recommendation of the ISEC can be incorporated as a requirement of the post-approval Rehabilitation Management Plan.

We trust this submission adequately addresses the other matters raised within the ISEC advice.

If you have any questions or wish to discuss this matter in further detail, please contact me on 0404 972 746 or rbush@wcl.net.au

Yours sincerely,

Ron Bush
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Wollongong Coal Limited